EMBRYOLOGY.[1]

EMBRYOLOGY OF INSECTS AND ARACHNIDS.[2]—Under this title, the friends of the author have issued the results of studies made by the late Dr. Adam Todd Bruce upon the embryology of Thyridopteryx, Chrysopa, Meloe, Mantis, the Grasshopper, Musca, and an undetermined spider. The most complete observations were made upon the development of Thyridopteryx, where Dr. Bruce failed to find the centrolicithal segmentation described as characteristic of arthropod embryology, but rather a central segmentation, the blastoderm arising by a migration of the resulting cells to the surface of the yolk. In his interpretation of the origin of the endoderm the author agrees well with the Hertwigs, regarding the primitive groove as a blastopore, and the cells which rise from its bottom as a compound of mesoderm and entoderm. The neurulation is normal; but the author differs from Hatschek in regarding the inter-neural ectoderm as forming the migratory mesoderm rather than the transverse commissures of the nervous system. The supra-œsophageal ganglion consists of two portions,the anterior supplying the antennæ, the posterior the labrum, thus showing that the antennæ are clearly prestomial in position. The few observations made upon the ontogeny of the compound eyes throw but little light upon their origin.

In the Orthopterous forms the segmentation is much like that of spiders or Astacus, the result being the formation of yolk-pyramids, the yolk proper being free from nuclei at one period. Later, yolk-nuclei were seen, which are regarded as migrating from the blastoderm. The mesoderm arises from the median groove, not from the lateral thickenings. The maxillæ in the embryo are triramose.

In the fly, observations were recorded on the development of the egg and its maturation, Dr. Bruce regarding the yolk as arising from the breaking down of the epithelium of the outer end of the ovarian tube.

In the spider, Dr. Bruce found the invagination for the optic vesicles (*vide* Pl. vi., Figs. lxxx and lxxxi.); but he erred in calling it the amniotic fold, otherwise (as he published a preliminary paper in which this fold was mentioned) he might have anticipated Locy in his discovery. Some observations are recorded upon the formation of the pulmonary organs, but, from reasons not apparent in either figures or text, the author thinks that two appendages are concerned in the formation of each lung-book. It is, however, to be noted that his observations, so far as they go, show that the lung-books are in reality modified appendages, and support the hypo-

[1] Edited by Prof. Jno. A. Ryder, University of Penna., Philadelphia.

[2] Observations on the Embryology of Insects and Arachnids. By Adam Todd Bruce. Baltimore, 1887. 4to; 9x31x17 pp.; 7 plates and portrait.

thesis of Lankester of the homology of the lungs and tracheæ of spiders with the gills and gill-appendages of Limulus.

Among the conclusions which are drawn, the following are worthy of note. The yolk-cells of hexapods and spiders are regarded as the true endoderm, but their purpose is the digestion of the yolk. The functional endoderm is of later origin, and forms the epithelium of the digestive tract. Spiders and the Merostomata are allied to each other, and differ from other arthropods in the absence of antennæ. The tracheæ of hexapods and of spiders are not homologous; for in the one they are clearly modified appendages, while in the other they occur on segments where well-marked appendages exist.—*J. S. K.*

The Development of Crangon.—In continuing my studies of the ontogeny of Crangon, I find the following points worthy of presentation, apart from my complete paper, soon to be issued. The blastopore, contrary to my previous statement, never becomes completely obliterated, but persists, and later an in-pushing takes place from the same spot and gives rise to the proctodæum.

The anus is at first *dorsal* in position, and attains its ventral position later by an outgrowth of the telson.

In front of the anus are a number of large budding-cells, both ectodermal and mesodermal, and from these are budded off new cells, which give origin to the segments of the body. They contribute largely to the nervous system and myotomes, and in them occur the only cases I have seen of karyokinesis in Crangon. They may be compared with the mesoblasts and neuroblasts of the leech, as described by Dr. Whitman.

The alimentary tract proper is wholly of *ectodermal* origin, the proctodeal and stomodeal inpushings, giving rise to all of it. The endoderm of invagination forms first migratory yolk-cells, which metabolise the yolk, and, later, arrange themselves to form the epithelium of the so-called "liver" or mid-gut gland of Frenzel.

The green gland is of mesodermal origin, as maintained by Grobben, and not of ectodermal, as described by Reichenbach and Ishikawa. This allows of its comparison with the segmental organs of the annelids. These points will be fully illustrated in the complete paper.—*J. S. Kingsley, Bloomington, Ind.*